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An Essay

On the Identity of Electricity
and Nervous Influence

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of Annapolis Md

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On the Identity of Electricity and the Nervous Influence.

No part of the anatomy and physiology of man is more important, than the nervous system. It is this system which forms the great characteristic between the vegetable and animal kingdoms. It is its greater developement, which renders one animal superior to another; and, and it is its perfection which renders man superior to the brute creation.

It is not my intention, in this Thesis, to describe the anatomical structure of the brain, the great organ of intellect, nor, of the nerves, which are the means of communication between the brain and other organs of the body, but, to offer such facts and arguments, as I have been able to collect, to prove the Identity of electricity and the nervous influence.

Let us inquire what is this agent, this nervous influence or fluid, which forms

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the connecting link between mind & matter, between the mere material machine and the immaterial and immortal principle of man. Is it a solid, is it a fluid, or is it an invisible fluid, as magnetism, heat, electricity, or galvanism?

We know, that it is through the the nerves that an impression, made on one of the senses the sense of touch, is conveyed to the centre of perception, and makes an impression, called a sensation; because if this nervous fibre is distroyed, no impression can be conveyed. We further know, that the power, by which the will acts through the centre of perception, on certain muscles, for the performance of certain motions or functions, is conveyed by nervous filaments, because, that power may be distroy-ed or modified by any thing which interupts this nervous connexion.

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But in neither case, do we know the exact medium of this communication.

It has been asserted by some, that a nerve is an assemblage of small tense cords, assimilated by their tension to solid bodies, and that an impression, made at one end, converges a sensation to the other; as on a rod, or tense string of a musical instrument.

Now, this simple fact, that the nerves are non-elastic, and must necessarily be relaxed during in flexions of the limbs, at once disproves this mechanical explanation.

Others assert, that the nervous fibre is a tube, filled with a gelatinous or fluid matter, which is a good conductor of impressions or impulses; and, that sensations are conveyed through this fluid, as in the labyrinth of the ear. It may be objected to this explanation, that it is by no means a

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determined fact in physiology, that the nerves are tubulated, much less has it been proved that they contain this gelatinous matter. Magendie says, he has repeatedly tried to ascertain whether the nervous fibres were tubes, but could never satisfy himself of the fact. However, this explanation is at once done away, by the recent experiments of Sir Ab Philip and others, which clearly established the fact that impressions may be conveyed, though the nerve be divided, provided, the ends of the nerve be not two far seperated.

Others believe, that the medium of this communication is a peculiar invisable fluide analogous to electricity or galvanism. Experiments recently made, have tended much to such a belief.

It had been long known, that a section of the pneumo gastric nerve disturbed

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the functions of the lungs and stomach, but, until recently, the exact effect of this section had not been discovered.

By the experiments of Dr. Philip, in London, and Dr Brachet, in Paris, the following facts have been elicited.

1.st That, if a part of a nerve is cut out, and the two ends of the divided nerve separated, the process of digestion is entirely suspended.

2.nd That the process of digestion, having been thus suspended, may be again established, to a certain extent, by bringing the two ends of the divided nerve into contact or, by introducing between them a conductor of electricity.

3.rd That the process of digestion, having been suspended as in the first operation, may be again established, by

in attaching to the lower end of the divided nerve, the positive pole of a galvanic battery, the negative end being in connexion with the lower end of the stomach, thus substituting the galvanic for the nervous influence.

The following experiments were tried on horses by Bréschet, after having been frequently successful on smaller animals.

Three horses were selected, and all fed on oats after a long abstinence. In one, the nerves of the stomach were divided, and their ends seperately, the second was left untouched. The third submitted to the following treatment: the nerves of the stomach were divided, and their ends seperated, as in the first horse, the lower ends of the nerves were then connected with the positive pole of a galvanic battery, the negative pole being connected with the lower end of the stomach.

following were the unequivocal results:
In the horse, that had been left untouched
when all the food was digested and passed
from the stomach to the intestines.
In the horse whose nerves had been divided
and connected with positive galvanic poles,
the food was almost in the same state,
as in the horse that had been untouched.

On the other hand; in the
horse, whose nerves had been divided
but not been galvanised, little or no digestion
had taken place, three times as much
undigested food having been found in
his stomach, as in the stomachs of the
other two horses.

Dr Boeschet objects to this
theory, and endeavours to prove, that, when
produced by galvanism after the section
of the pneumo-gastric nerve, it is not by

in chemical change, but in exciting the coats of the stomach; and, he has endeavoured to prove by experiment, that mechanical irritation has the same effect in a lesser degree.

But, to this opinion of Broschet, we may readily oppose the result of Dr. Philip's experiments who, says he has repeated the experiment of mechanical irritation, after the section of the nerves alluded to, and that the food exhibited no more appearance of digestion than when there was no mechanical irritation; although the experiment was continued for eight hours, the time the animal lived after the operation. Dr. Philip asserts this with confidence, because he is perfectly acquainted with the appearance of the rabbits stomachs under those experiments, a rabbit being the animal operated on by Broschet.

These experiments, therefore, if they do not prove that the galvanic fluid and nervous influence are identical, at least prove conclusively that in digestion, the one may be substituted for the other, a fact that had been long established as far as regards muscular action, by galvanizing recently eviscerated animals, and thereby producing in them, vivid and long continued muscular contractions.

The great difficulty has been with many, to comprehend how a fluid, which so far as we can judge, is produced in mechanical and chemical means alone, can be acted upon by the brain, an organ in which such actions can take place.

But have we not analogous instances, in the secretion of the fluid heat in all warm blooded animals, and in light which is secreted by the Firefly & Fireflies?

and yet, these facts are not doubted, although we cannot explain their phenomena.

However, so as to prevent our being left in doubt, as to the power of the brain to secrete the electric fluid, nature has furnished us with unequivocal instances of it in the Torpedo, and other electrical animals. It is well known, that the Raia Torpedo, the Gymnotus Electricus, & Silurus Electricus, have the power of giving out, at pleasure, violent electrical shocks; so much so, as to benumb, or destroy smaller animals, and even man, when rash enough to bear its influence. It was, for a long time, doubted whether this was purely an electrical phenomenon; but the fact is now established, beyond the possibility of doubt. By experiments, it has been proved, that these animals give out, at pleasure, successive shocks of electricity; and that this electricity differs, in no wise, from that excited, from an electrical machine.

fact [illegible] Galvanism, the animal was in a long time considered a mere electrical machine, and the electricity was supposed to be evolved by friction produced by muscular action. But it has been proved, by delicate experiments, that the movement is entirely involuntary, no matter how vigorous having been found, exhausted, or destroyed the necessary friction, and no matter what was the power of exciting it by friction. Besides it has been proved, that the animal in the power, when completely isolated, of influencing to excite the electrical fluid, as long as vitality exists, a power which no electrical machine possesses; for, in all cases, where electricity is excited by friction the negative pole of the galvanic must be in communion with the earth, or some other great electrical reservoir. It has been further discovered, that the animal has not the

[illegible] of secreting the fluid, or cleansing, the [illegible] collected, in some [illegible] insects, in [illegible] in connexion with the convoluting [illegible] of its external integuments.

The immediate source of the fluid was, still doubtful, when Mr Hunter clearly established, in defiance, that it was derived from the [illegible] and brain of the animal, and the [illegible] apparatus of the animal consisted of a member resembling a [illegible] cartilaginous substance, lined with a [illegible] substance completely [illegible] a cylindrical membrane, on the [illegible] of the animal, and receiving [illegible] nerves from the brain. This is the electrical reservoir, which receives the fluid secreted in the [illegible], through the large nervous branches [illegible] connected with that organ.

"no apparatus, having not little sensation or motion, could have required but small nerve for its direct, if it now not even for the more mysterious of nature, which thus enable the animal to lay up a supply of electricity for its defence, and the destruction of its prey.

"Thus we have clearly established these important facts, that animals have the power of secreting electricity, that the brain is the organ of this secretion, and that the nerves are its conductors.

In the 8th volume of the edinburgh Medical Review, we have the following facts and observations, which tend much to establish the identity of electricity and the nervous influence. Dr Edwards has proved, that electricity is necessary to muscular contraction, in the following simple experiment.

in vivo nerve, a very ~~abrupt~~ separated, a considerable distance from the surrounding parts, and supported by a non-conductor of electricity. When this separated part was rubbed, by any dull body, muscular contractions took place, although the limb was at the same time unconnected with the sensorium. But when the limb was supported by a conductor of electricity, there were no contractions in the limb, the fluid passing off to the conductor, instead of flowing the course of the nerve.

The phenomena of acupuncturation, a practice first adopted by the Japanese, and recently introduced into Europe and this country has thrown some light on this subject. In many painful nervous affections, rheumatism &c, and in many cases of local inflammation, acupuncture has given almost immediate relief.

the explanation of this phenomenon has been a difficult one, some attributed the relief to counter irritation, and others the magnetism of the patient's system, others to both, but neither of these explanations are satisfactory. The very slight irritation, varying, produced by the operation, is a convincing proof, that the relief obtained is not to be attributed to counter irritation. nor is it to be accounting, in some of the cases, just a slightest degree. The fact that the relief is not dependent on the influence the magnetism has been proved by experiment.

It has been recently discovered that, in all cases where relief was obtained the needles exhibited strong marks of the patient's influence; and, the probability, that the relief is obtained by the mere

nerves as an electrical conductor to the superfluous animal electricity, an accumulation which, in the part affected, constitute the disease. Some of the French surgeons have recently proved this, beyond the possibility of a doubt, by the use of delicate Electrometers, which clearly indicated the escape of the fluid in such cases.

From all these facts, I think we are justified in concluding, that the nervous and electrical fluids are identical and, that electricity is the fluid which nature employs to occupy this important station in the human system. And surely a more suitable agent could not well be imagined; the rapidity, with which it raises through its conductors, is such

that no perceptible time is occupied, in conveying by it, impressions from the extremities to the centre of perception. Isolated by non conductors, it can only flow through those channels provided for its passage.

Occupying, as it does, so large a space in the great storehouse of nature; elicited and acting in all her operations, from the evaporation or condensation of a drop of water, to the explosion of a thunder cloud, this invisible and almost incomprehensible fluid, we must admit, a worthy instrument with which the mind of man may be connected with its proper materials.

How, it may be asked, can a fluid, which conveys but one impression produce all the modified actions of motion, sensation, and thought.

Sir Charles Bell has already established the fact, that different nervous fibres are employed in the conveyance of impressions, and the induction of motions, and, it is probable that a corresponding difference in the organization of the instruments is sufficient to produce all their different modifications.
For example; light produces one impression on the Retina, and another on the Iris, and none on the surface of the body; while heat produces an impression on the surface of the body, and none on the Iris, or Retina; and yet, it is more than probable, that the nerves, which convey these impressions, are of the same organization, and that the modifications of their impressions are the result of a different organization in the part receiving the impression.

Thus then we may consider, the brain and spinal marrow as the secreting organs of this subtle agent of the mind, which, seated at the centre of perception, conveys to, and receives from, the different parts of the system, the perceptions, impressions, and motions, which constitute the functions of the organic and animal lives.

All the intellectual operations, sentiments, and passions, and indeed every action connected with motion, sensation, or thought, are performed through, the agency of this secreted fluid. Every sensation, motion, and mental operation being performed by an expenditure of the nervous influence, a constant supply must be furnished by the brain and spinal marrow,

and conducted by the nerves to the different parts of the system. These nerves are good conductors, and are isolated, in their course, by cellular substance.

In health, there is an equal distribution of this fluid to all the organs; and its unequal distribution is, in many cases, the cause of disease. If ~~too~~ large a proportion of it is expended, in the operations of the mind, the muscular system languishes, and the digestive organs are deranged for want of their necessary stimulus. For this reason, we find, that men of intense application are liable to all those diseases of the muscular and digestive systems which are dependant on a deficiency of the nervous fluid, as languor, dyspepsia,

defective secretion of bile, and torpor of the bowels. And, in such cases, abstinence from mental exertion, and an increase of muscular exercise, will alone afford permanent relief.

From Magendie's Journal of Physiology, we have the following extract, which proves that an Electro Magnetic influence is derived from Acupuncture. Mr Pouillet, after making a complete circuit through a needle, and through the patients mouth, found by means of a multiplier of Scheweigher with a magnetic needle, that the Electro Magnetic relation could be readily produced at least, so far as to affect small vibrations backwards and forwards.

It may be enquired, what is the advantage to be derived from

establishing the identity of the nervous influence and electricity?

As before stated, a large class of diseases is dependant upon a deficiency of the nervous influence or animal electricity. This animal electricity, which is secreted, we can neither controul nor command; but the mechanical which is identical; we can controul and command, and we can substitute the one for the other. This has been done by Sir W Philip, M Earle, and others, in cases (in cases, of dyspepsia, torpor of the secreting viscera, asthma, paralysis, and other diseases dependant on the same causes. In some of these cases, the two poles were thus applied: the positive to the back of the neck, and the negative to the region of the stomach, and the fluid was thus passed, through the

affected part. Mr. Bellingham, more lately made the needle the medium for introducing galvanism, by first applying the needles, as in acupuncture, and applying the positive pole to one needle, and the negative to the other. They considered this the most effectual way of applying galvanism.

Mr Sarlandier resorted to galvanism to aid the action of the needles, by applying the negative pole only to the needles.

It has been suggested by Sir M. Philip, and practised by others with success, to apply the galvanism by two plates, the one of copper, and the other of zinc, worn with the ordinary dress.

Even the electricity, generated by wearing a silk and flannel garment together, might be useful in such cases.

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Another clap of diseases, as spasmodic and local inflamatory, is, no doubt, produced or kept up by a superfluous quantity of electricity in the affected part. How this irregular distribution of animal electricity takes place, we pretend not to say; but we must admit the fact, that relief is, in many cases, afforded by acupuncture, which acts by taking of superfluous electricity.

The extent, to which the useful practical application of electricity to disease may be carried, is yet to be learned, though many cases of its utility, are recorded in the modern periodical journals. It should be remembered, that the most important facts, on which this theory is founded, are of but recent discovery, and that time has not

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yet been afforded, for the general diffusion, or practical application of this knowledge, and I have no doubt, that the time will soon arrive, when the electrical machine, and galvanic trough, from which we now derive but little benefit, will be one of our most powerful remediallc agents, and that many diseases, now incurable, will by their judicious application, be placed entirely under the controul of our art.

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